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(19)

(54) VEHICLE SUSPENSION SYSTEMS

(71) We, BRITISH STEEL CORPORATION, a British Corporation incorporated and existing under the Iron & Steel Act 1967 of 33 Grosvenor Place, London, S.W.1., do

hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to vehicle suspension systems and more particularly relates to such a system having a variable rate.

The present invention provides a vehicle suspension system comprising main and auxiliary leaf springs secured to a frame for clamping to an axle housing, each end of the main spring and one end of the auxiliary spring being adapted to be coupled to the vehicle chassis or body and wherein the other end of the auxiliary spring is connected to the frame through a pivotal joint on an extension piece by which its forward point of contact with the frame proper progressively moves along from this joint as the load on the vehicle increases, the two springs providing thereby a composite assembly the rate of which varies with the load applied.

The main spring may be a semi-elliptical spring and the auxiliary spring may be a quarter-elliptical spring; they may each be tapered along their length.

The main spring may be constituted with multiple leaves and the two 'cantilevered' ends of this spring may be designed to carry different loads, the rate or stiffness of the one, adjacent the auxiliary spring, being smaller than that of the other.

With a system according to this invention, when the vehicle is unladen the auxiliary spring is practically unstressed so that the vehicle gives a soft ride as determined by the main spring characteristics; as the vehicle is laden so the auxiliary spring is utilised progressively to a greater degree with increasing load and the composite rate of the spring assembly automatically increases.

A suspension system according to this invention is particularly suitable for use as the rear suspension in commercial vehicles.

In order that the invention may be fully understood, one embodiment thereof will now be described, by way of example, with reference to the accompanying drawings in which:—

Figures 1(a) and 1(b) schematically illustrate a side elevation of a suspension system according to this invention in an unladen and a laden condition, respectively; and

Figure 2 illustrates a typical load-deflection curve realised with this embodiment.

Referring now to Figures 1(a) and 1(b) a semi-elliptical tapered spring 5 is secured to a frame 6 which in turn is clamped by U-bolts 7 to an axle housing 8. Cantilever 9 of this spring is pivotally secured to a lug 10 dependent from the vehicle body or chassis 11 and has a stiffness or rate greater than cantilever 12 which is secured to the body through a shackle 13.

Mounted above the spring 5 is a quarter-elliptical tapered spring 14. This spring is pivotally secured at one end to an extension piece 15 of the frame 6 and at its other 'remote' end it is secured to the body by a shackle 16.

Figure 1(a) shows the assembly in the condition in which the vehicle is unladen from which will be seen that the spring 14 bears on the frame only at one end so that the effective length of the spring is at its maximum. As the load on the vehicle increases, the body 11 will, of course, be depressed towards the axle housing, the rake on the shackle 16 increasing and the forward point of contact between the frame and the spring 14 moving towards its remote end to a limiting position shown in

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Figure 1(b). The stiffness of this spring thus increases progressively with load to the limiting position. The characteristics of the main spring 5 remain consistent throughout the load change so that the two springs together provide a composite assembly the rate of which varies with the load applied; the effect of this system is to give a soft ride on the vehicle when it is unladen and which is yet adequate to realise the harder or tougher suspension when laden.

A typical load-deflection curve realised with this arrangement is shown in Figure 2.

Although the suspension system has been described with reference to the specific embodiment illustrated it is to be understood that various modifications may readily be made without departing from the scope of this invention. For example, plain leaf springs could be employed instead of the tapered ones shown and multi-leaf assemblies could be provided, depending on requirements.

WHAT WE CLAIM IS:—

1. A vehicle suspension system comprising main and auxiliary leaf springs secured to a frame for clamping to an axle housing, each end of the main spring and one end of the auxiliary spring being adapted to be coupled to the vehicle chassis or body and wherein the other end of the auxiliary spring is connected to the frame through a pivotal joint on an extension piece by which its forward point of contact with the frame proper progressively moves along from this joint as the load on the vehicle increases, the two springs providing thereby a composite assembly the rate of which varies with the load applied.

2. A system according to claim 1, wherein the auxiliary spring is quarter-elliptical.

3. A system according to claim 1 or claim 2, wherein the one end of the auxiliary spring is adapted to be coupled to the vehicle chassis through a shackle.

4. A system according to any one of claims 1 to 3, wherein the main spring is semi-elliptical.

5. A system according to claim 4 wherein the main spring is secured to the frame at its centre, the two cantilevered ends of the spring being designed to carry different loads.

6. A system according to claim 4 or claim 5, wherein the stiffness of that end of the main spring adjacent the auxiliary spring is smaller than that of the other.

7. A system according to claim 6, wherein one end of the main spring is adapted to be coupled to the vehicle chassis through a shackle whilst the other end is adapted to be secured to a lug on the chassis.

8. A system according to any one of claims 1 to 7, wherein the main spring is constituted by multiple leaves.

9. A system according to any one of claims 1 to 8, wherein each of the said springs is tapered along its length.

10. A vehicle suspension system substantially as herein described with reference to the accompanying drawings.

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1,364,671 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

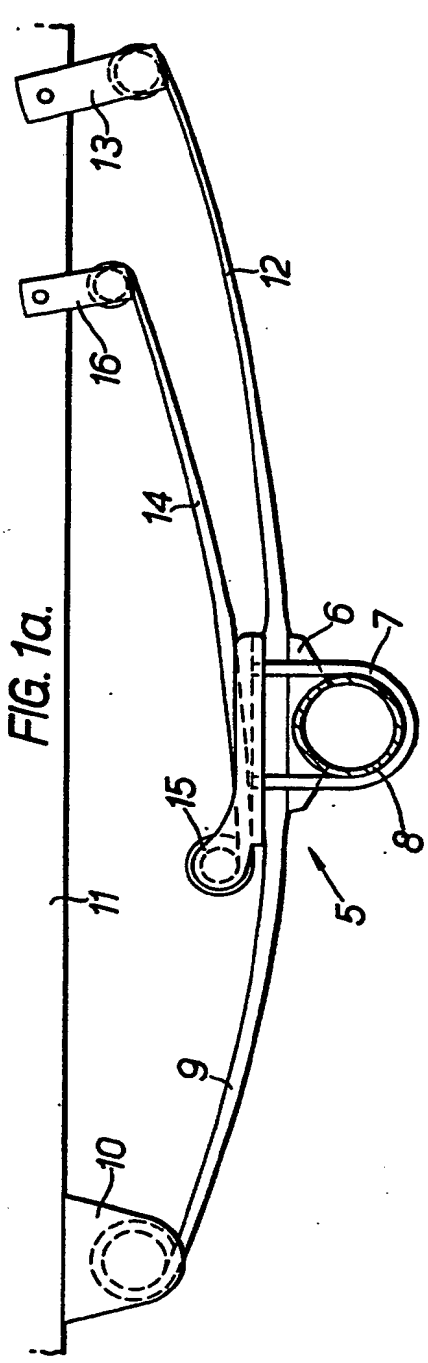

FIG. 1a.

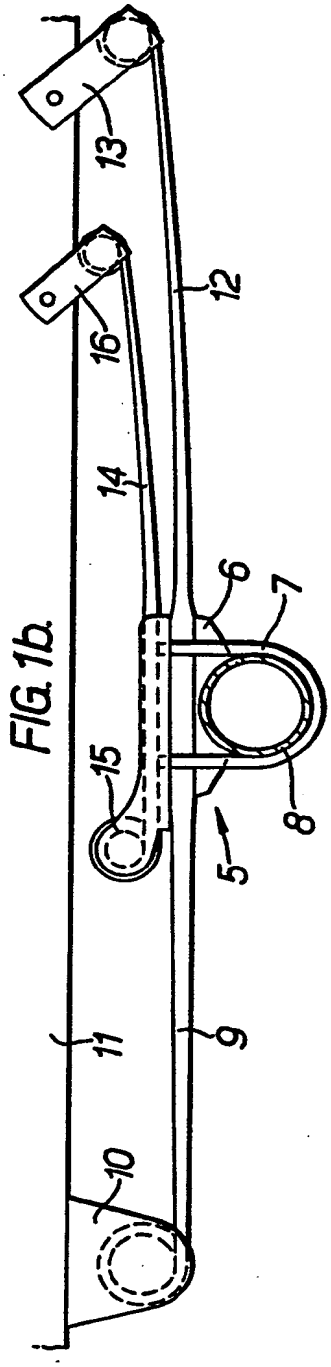

FIG. 1b.

FIG. 2.